

## PHARMACEUTICAL PACKAGING ON DEMAND

### BACKGROUND OF THE INVENTION

#### 1. Technical Field:

5 The present invention relates to methods and systems for packaging medication and to computer software for controlling the packaging of medication.

#### 2. Description of Related Art:

10 Scientific medicine at the beginning of the 19<sup>th</sup> century was heroic medicine. All diseases were thought to result from an excess of fluids, and the cure was to relieve the body of the excesses through bloodletting and purging. However, such treatments were painful and debilitating. Since the scientific community was doing little to improve medicine and since the public was rebelling against these painful and debilitating treatments of heroics, a void developed in medical treatment. Lay health reformers and practitioners rushed in with "theories" of their own. Their treatments included water, electricity, manipulation of animal magnetism, and vegetable compounds.

15 It was not until the end of the 19<sup>th</sup> century that scientific advances began to catch up with the medical needs of the public. Civil War hospital experiences and the new theories of bacteriology slowly produced fundamental changes in medical practice. Medical training adapted to the growing knowledge base of the profession, and by the end of the century, America was well on its way to having the best medical care in the world.

20 During the 20<sup>th</sup> century great scientific advancements were made in the field of pharmacology to provide more effective cures and treatments for diseases previously thought to be incurable. As medicine continued to advance, more and more medications

were developed to treat a great variety of ailments. Today, the number of medications available to treat diseases is enormous.

Although medicine has advance significantly, methods of directing and ensuring that patients take their medications has not improved significantly from the “snake oil” days of the 19<sup>th</sup> century. The current method of instructing patients in taking their medication and ensuring that the medication is taken is much the same as it has been: the doctor prescribes a treatment, provides the patient with written or oral directions on how to take the medication, and then relies on the patient to implement the instructions. Such a method may be fine when the patient is required to take only one or two medications for a limited amount of time. However, with the aging of the population and the ever increasing number of diseases for which pharmaceutical treatment is available, such a method is inadequate.

For instance, memory problems become more acute in elderly individuals. This fact coupled with the fact that many elderly individuals may need to take more than a half dozen medications several times a day for prolonged periods of time make it likely that some dosages will be missed or that extra dosages will be taken. For individuals with serious illnesses or diseases missing a dose of medication could be seriously detrimental to their health. Similarly, many medications are dangerous if taken in too high of concentrations, thus taken too many doses is also a problem. Therefore, it would be desirable to have an improved medication package and an improved method and system for creating medication packaging such that the risk that a patient forgets to take a dosage of medication or takes too many doses is reduced.

## SUMMARY OF THE INVENTION

The present invention provides a medication package and method, system, and computer program product for making same. In one embodiment, medications are grouped into dosage groups. Each dosage group contains at least one element of medication, such as a pill or capsule. Furthermore, each element of medication in a dosage group should be taken by a patient at substantially the same time as other elements of medication in the same dosage group. Each dosage group of medication is placed into a separate compartment in a package. The compartments of the package are covered and labeled with an indication of the time for which the associated medications within the compartment should be taken by a patient. The compartments are covered in such a manner such that removal of a dosage group from the package provides an indication to a patient that the medications in the dosage group have been taken by the patient.

## BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself, however, as well as a preferred mode of use, further objectives and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

**Figure 1** depicts a pictorial representation of a network of data processing systems in which the present invention may be implemented;

**Figure 2** depicts a block diagram of a data processing system that may be implemented as a server in accordance with a preferred embodiment of the present invention;

**Figure 3** depicts a block diagram illustrating a data processing system in which the present invention may be implemented;

**Figure 4** depicts a diagram illustrating a pharmaceutical packaging and delivery system in accordance with the present invention;

**Figures 5-7** depict diagrams illustrating pharmaceutical packaging in accordance with the present invention; and

**Figure 8** depicts a process flow and program function illustrating a method for packaging mediations in accordance with the present invention.

**DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

With reference now to the figures, **Figure 1** depicts a pictorial representation of a network of data processing systems in which the present invention may be implemented.

Network data processing system **100** is a network of computers in which the present invention may be implemented. Network data processing system **100** contains a network **102**, which is the medium used to provide communications links between various devices and computers connected together within network data processing system **100**. Network **102** may include connections, such as wire, wireless communication links, or fiber optic cables.

In the depicted example, server **104** is connected to network **102** along with storage unit **106**. In addition, clients **108**, **110**, and **112** are connected to network **102**. These clients **108**, **110**, and **112** may be, for example, personal computers or network computers. In the depicted example, server **104** provides data, such as boot files, operating system images, and applications to clients **108-112**. Clients **108**, **110**, and **112** are clients to server **104**. Network data processing system **100** may include additional servers, clients, and other devices not shown. In the depicted example, network data processing system **100** is the Internet with network **102** representing a worldwide collection of networks and gateways that use the TCP/IP suite of protocols to communicate with one another. At the heart of the Internet is a backbone of high-speed data communication lines between major nodes or host computers, consisting of thousands of commercial, government, educational and other computer systems that route data and messages. Of course, network data processing system **100** also may be implemented as a number of different types of networks, such as for example, an intranet, a local area network (LAN), or a wide area network (WAN). **Figure 1** is intended as an example, and not as an architectural limitation

for the present invention.

Referring to **Figure 2**, a block diagram of a data processing system that may be implemented as a server, such as server **104** in **Figure 1**, is depicted in accordance with a preferred embodiment of the present invention. Data processing system **200** may be a symmetric multiprocessor (SMP) system including a plurality of processors **202** and **204** connected to system bus **206**. Alternatively, a single processor system may be employed. Also connected to system bus **206** is memory controller/cache **208**, which provides an interface to local memory **209**. I/O bus bridge **210** is connected to system bus **206** and provides an interface to I/O bus **212**. Memory controller/cache **208** and I/O bus bridge **210** may be integrated as depicted.

Peripheral component interconnect (PCI) bus bridge **214** connected to I/O bus **212** provides an interface to PCI local bus **216**. A number of modems may be connected to PCI local bus **216**. Typical PCI bus implementations will support four PCI expansion slots or add-in connectors. Communications links to network computers **108-112** in **Figure 1** may be provided through modem **218** and network adapter **220** connected to PCI local bus **216** through add-in boards.

Additional PCI bus bridges **222** and **224** provide interfaces for additional PCI local buses **226** and **228**, from which additional modems or network adapters may be supported. In this manner, data processing system **200** allows connections to multiple network computers. A memory-mapped graphics adapter **230** and hard disk **232** may also be connected to I/O bus **212** as depicted, either directly or indirectly.

Those of ordinary skill in the art will appreciate that the hardware depicted in **Figure 2** may vary. For example, other peripheral devices, such as optical disk drives and the like, also may be used in addition to or in place of the hardware depicted. The depicted example is not meant to imply architectural limitations with respect to the present invention.

With reference now to **Figure 3**, a block diagram illustrating a data processing system is depicted in which the present invention may be implemented. Data processing system **300** is an example of a client computer. Data processing system **300** employs a peripheral component interconnect (PCI) local bus architecture. Although the depicted example employs a PCI bus, other bus architectures such as Accelerated Graphics Port (AGP) and Industry Standard Architecture (ISA) may be used. Processor **302** and main memory **304** are connected to PCI local bus **306** through PCI bridge **308**. PCI bridge **308** also may include an integrated memory controller and cache memory for processor **302**. Additional connections to PCI local bus **306** may be made through direct component interconnection or through add-in boards. In the depicted example, local area network (LAN) adapter **310**, SCSI host bus adapter **312**, and expansion bus interface **314** are connected to PCI local bus **306** by direct component connection. In contrast, audio adapter **316**, graphics adapter **318**, and audio/video adapter **319** are connected to PCI local bus **306** by add-in boards inserted into expansion slots. Expansion bus interface **314** provides a connection for a keyboard and mouse adapter **320**, modem **322**, and additional memory **324**. Small computer system interface (SCSI) host bus adapter **312** provides a connection for hard disk drive **326**, tape drive **328**, and CD-ROM drive **330**. Typical PCI local bus implementations will support three or four PCI expansion slots or add-in connectors.

25 operating system may be a commercially available operating system, such as Windows  
2000, which is available from Microsoft Corporation. An object oriented programming

system such as Java may run in conjunction with the operating system and provide calls to the operating system from Java programs or applications executing on data processing system 300. "Java" is a trademark of Sun Microsystems, Inc. Instructions for the operating system, the object-oriented operating system, and applications or programs are  
 5 located on storage devices, such as hard disk drive 326, and may be loaded into main memory 304 for execution by processor 302.

Those of ordinary skill in the art will appreciate that the hardware in **Figure 3** may vary depending on the implementation. Other internal hardware or peripheral devices, such as flash ROM (or equivalent nonvolatile memory) or optical disk drives and  
 10 the like, may be used in addition to or in place of the hardware depicted in **Figure 3**. Also, the processes of the present invention may be applied to a multiprocessor data processing system.

As another example, data processing system 300 may be a stand-alone system configured to be bootable without relying on some type of network communication  
 15 interface, whether or not data processing system 300 comprises some type of network communication interface. As a further example, data processing system 300 may be a Personal Digital Assistant (PDA) device, which is configured with ROM and/or flash ROM in order to provide non-volatile memory for storing operating system files and/or user-generated data.

20 The depicted example in **Figure 3** and above-described examples are not meant to imply architectural limitations. For example, data processing system 300 also may be a notebook computer or hand held computer in addition to taking the form of a PDA. Data processing system 300 also may be a kiosk or a Web appliance.

With reference now to **Figure 4**, a diagram illustrating a pharmaceutical  
 25 packaging and delivery system is depicted in accordance with the present invention. Pharmaceutical packaging and delivery system 400 is a system for providing



pharmaceuticals to persons in custom packaging such that each drug or pharmaceutical dose that a person needs to take at any given time is contained in a single section of packaging, such as a single section of a blister or foil pack. Blister packs and foil packs are types of packaging medications that are well known in the art and commonly used for “over the counter” drugs. For example, if the person needs to take drug A, drug B, and drug C in the morning and drug A and drug D in the evening, a package with, for example, a blister pack for each morning and evening for each day is created. Each morning section of the blister pack contains one dose of drugs A, B, and C and each evening section of the blister pack contains one dose of drugs A and D. The packaging over each blister contains labeling indicating the day and time at which the dose contained in that blister should be taken. Thus, a patient may look at the packaging and determine whether they have taken their medicine and avoid taken a double dose of the medicine because they have forgotten that they have already taken their medication. Also, if the patient has missed a scheduled dose, the patient will be able to determine this because the packaging with the appropriate dosage has not been opened. Thus, the patient can take appropriate action. This action may simply be, for example, to take the missed dosage or to call the patient’s physician or pharmacist for instruction. Pharmaceutical packaging and delivery system 400 includes a pharmaceutical server 406, order processing unit 412, pharmaceutical storage 408, pharmaceutical packaging 410, network 404, client 402, and transport 416. Network 404 may be implemented as, for example, network 102 in Figure 1. Pharmaceutical server 406 may be implemented as, for example, server 200 in Figure 2 and client 402 may be implemented as, for example, data processing system 300 in Figure 3.

Client 402 enables a patient 422, or the patient’s doctor or pharmacist or other agent, to contact a pharmaceutical server 406 via network 404 to send the patient’s 422 prescription or prescriptions via e-mail or through filling out a form on a web page to an

on-line pharmacy to be filled. Alternatively, the patient **422**, patient's doctor, or other agent of the patient may telephone or fax in the prescription or hand deliver the prescription to the pharmacy **440**. Upon receiving the prescription, if the prescription contains an order for several medications, the pharmaceutical server **406** may check a database to determine if there or any potential interactions between the medications or if there is a recommendation that certain medications that have been prescribed not be taken with each other. The pharmaceutical serer **406** may also notify a pharmacist of the prescription, allowing the pharmacist to review the prescription and authorize the prescription to be filled.

Once the prescription has been authorized to be filled, the pharmaceutical server **406** sends the prescription to order processing **412** which obtains the appropriate quantity of the medication or medications from pharmaceutical storage **408**. Order processing **412** also obtains pharmaceutical packaging from pharmaceutical packaging storage **410**. The packaging obtained from pharmaceutical packaging storage **410** contains several compartments within each package, wherein each compartment holds the medication for a particular day and time of day. Order processing **412** places the appropriate quantities and types of medications that should be taken at a particular time of day on a particular day in the several compartments of the package. Once the compartments are filled, the compartments are covered or sealed with packaging that includes labeling indicating the day and time of day for which the dosage in each compartment should be taken. In a preferred embodiment, this labeling is printed on the labeling located immediately above the compartment for which the corresponding dosage is contained. In addition to the time at which each dosage should be taken, other instructions and warnings may also be printed on the packaging. The packaging could be, for example, a blister pack or a foil pack. However, other types of packaging may be used as well. Methods of filling and sealing blister packs and foil packs with medication are well known in the art.

Once the prescription has been filled and is ready for shipping, order processing 412 sends the packaged medication 418 to shipping 414 which ships the medication to the patient 422 through transport 416. The packaged medication 418 is then delivered to the patient 422 by, for example, a delivery person 420.

5 If the patient notices that a dose has been skipped because a compartment corresponding to a scheduled dose has not been opened and it is past the time for the dose, the patient may access a web site corresponding to the pharmacy 440 to determine what action to take. The patient may then supply the pharmacy with a patient name, patient ID, prescription number, and/or password to access the patient's information. The  
 10 patient may then indicate that a particular dosage has been missed by indicating, for example, the time of the scheduled dosage that was missed. The pharmacy 440 will then correlate the time with the medications that should have been taken and determine what action should be taken by the patient. For example, the advice may simply be to take the missed dose immediately and then continue with the schedule, to just skip the missed  
 15 dose and continue with the remainder of the medication, or a revised schedule may be generated and transmitted to the patient. The patient may then print out the revised schedule on adhesive paper and affix the revised schedule over the previous schedule on the packaging. Of course other actions may be taken as well as will be recognized by one skilled in the art.

20 The information associated with the prescription may also be stored on server 406 or related storage device such that a replacement or revised copy of the labeling instructions may be printed and sent to the patient to place over the packaging.

**Figure 4** is intended as an example and not an architectural limitation of the present invention. For example, in other embodiments, rather than filling the prescription  
 25 at an on-line pharmacy via a network such as the Internet, the prescription may be taken directly to a bricks and mortar pharmacy which then packages the dosages into individual

compartments of packaging with appropriate labeling to aid the patient in taken the appropriate medications at the appropriate time. Furthermore, in other embodiments, the patient may purchase a packaging equipment to package their medication appropriately after the prescription has been filled. In other embodiments, the packaging may take

5 place at the factory or by a doctor.

With reference now to **Figures 5-7**, a diagram illustrating pharmaceutical packaging is depicted in accordance with the present invention. **Figure 5** shows a package **500** containing several compartments **501-506** in which dosages of medication may be placed. Each compartment contains a dose of medication for a particular day and

10 time. In the depicted example, the patients medication includes three types of medicine: medication A **510-511**, **514**, **516-517**, and **520**, medication B **512**, **515**, **518**, and **521**, and medication C **513** and **519**. The medications **510-521** have been divided out into appropriate dosages for appropriate times in preparation for placing the medication

**510-521** into the appropriate compartments **501-506** of packaging **500**.

15 In **Figure 6**, the medications **510-521** have been placed into respective compartments **501-506** of packaging **500**. In the depicted example, two tablets **510-511** of medication A and one tablet **512** of medication B have been placed into compartment **505**. One tablet **513** of medication C has been placed into compartment **504** and one tablet **514** of medication A and one tablet **515** of medication B have been placed into

20 compartment **503**. Compartments **506**, **501**, and **502** are filled in similar fashion. In one example, the depicted packaging may correspond to a prescription in which the patient should take two tablets of medication A and one tablet of medication B in the morning, one tablet of medication B at noon, and one tablet of medication A and one tablet of medication B in the evening. Thus, package **500** may contain two days of medication

25 with compartments **505**, **504**, and **503** containing morning, noon, and evening doses respectively for day one and compartments **506**, **501**, and **502** containing morning, noon,

and evening doses respectively for day two.

Referring now to **Figure 7**, the packaging **500** is depicted after the top layer of packaging has been applied. The top layer of packaging seals or otherwise closes and protects the medication within each of compartments **501-506**. The top layer of packaging material is printed with instructions **701-706** which preferably should be located above the compartment **501-506** containing the dosage of medications **510-521** to which the instructions **701-706** apply. However, other locations for instruction placement is possible so long as it is obvious to a patient as to which compartment **501-506** the instructions correspond. The instructions **701-706** include the day and time for which the dosage corresponding to the instruction should be taken by the patient. The instructions **701-706** may contain other information as well such as, for example, a list of the medications included in the dosage in the corresponding compartment **501-506**, directions for use, warnings, and precautions. The packaging **500** may be constructed from plastic, paper, cardboard, foil, or any of any other packaging material suitable for protecting and storing medications. However, whatever materials are chosen, packaging **500** is constructed in a manner such that when a dosage is taken from compartments **501-506**, strong physical evidence remains that the dosage has been taken. For example, if blister packs are used, removing the medication from the blister pack leaves a whole in the packaging and an empty compartment, thereby indicating to the patient that the medication has been taken.

Packaging **500** is an example of packaging that provides a user with medication in which medications to be taken at substantially the same time are packaged and grouped together with an indication of the time in which the medication should be taken in accordance with the present invention and is not meant to describe an exhaustive list of types of packaging that are consistent with the present invention.

With reference now to **Figure 8**, a process flow and program function illustrating a method for packaging medications is depicted in accordance with the present invention. To begin, one or more pharmaceutical prescriptions are received by a pharmacy (step **802**). The pharmacist or automated system retrieves the appropriate medications (step **804**) and a suitable packaging (step **806**). The pharmacist or system then groups the medications in quantities and types according to when the medications should be taken and places the medications into separate sections of packaging (step **808**). Each separate section of packaging contains only medications that should be taken substantially simultaneously. The packaging is then closed or sealed and each section is labeled with an appropriate time for which the medication within that section should be taken as prescribed by the prescription (step **810**). The labeling may also include other instructions as well, such as, for example, the name of the medication or medications, the name of the patient, directions for use, and warnings. Also, the time and date may be specific such as, for example, 8:00am on April 25, 2001 or may be more generic such as, for example, morning on 1<sup>st</sup> day. Also, the labeling may be printed directly onto the packaging or may be printed onto a label and affixed to the packaging with for example, glue.

Although described primarily in terms of prescription medications, the present invention may also be used with non-prescription medications or with a combination of prescription and non-prescription medications. Furthermore, the packaging may include snacks in the compartments with the medications for medications that require that the medication not be taken on an empty stomach.

It is important to note that while the present invention has been described in the context of a fully functioning data processing system, those of ordinary skill in the art will appreciate that the processes of the present invention are capable of being distributed in the form of a computer readable medium of instructions and a variety of forms and that

the present invention applies equally regardless of the particular type of signal bearing media actually used to carry out the distribution. Examples of computer readable media include recordable-type media, such as a floppy disk, a hard disk drive, a RAM, CD-ROMs, DVD-ROMs, and transmission-type media, such as digital and analog  
5 communications links, wired or wireless communications links using transmission forms, such as, for example, radio frequency and light wave transmissions. The computer readable media may take the form of coded formats that are decoded for actual use in a particular data processing system.

The description of the present invention has been presented for purposes of  
10 illustration and description, and is not intended to be exhaustive or limited to the invention in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art. Although the depicted illustrations show the mechanism of the present invention embodied on a single server, this mechanism may be distributed through multiple data processing systems. The embodiment was chosen and described in  
15 order to best explain the principles of the invention, the practical application, and to enable others of ordinary skill in the art to understand the invention for various embodiments with various modifications as are suited to the particular use contemplated.